Claims

1. A system for sharing a cellular tower among multiple service providers comprising:

an antenna having an array of elements operable to define multiple, individual beams for signals in a communication frequency band;

converter circuitry to convert the antenna signals associated with the beams between the communication frequency band and a digital band;

filtering circuitry defining individual portions of the digital band, a band portion defined for signals of each of at least two individual service providers;

signal processing circuitry for each of the at least two service providers, the signal processing circuitry operable to process channel signals associated with the individual band portions defined for the individual service providers and to simultaneously drive the antenna to define at least one individual beam for each individual service provider.

2. The system of claim 1 wherein the converter circuitry includes frequency converter circuitry to convert the antenna signals between the frequencies of the communication frequency band and intermediate frequencies for the band; and

digital converter circuitry to convert the signals between the intermediate frequencies and a digital band.

3. The system of claim 1 wherein the signal processing circuitry defines multiple individual beams for each individual service provider.

4. The system of claim 1 further comprising a digital multiplexor to duplicate the signals of the digital band for the multiple service providers prior to defining individual portions of the digital band.

5. The system of claim 1 wherein said antenna comprises an array of elements arranged in columns of multiple elements, the signal processing circuitry defining the individual beams by individually controlling each of the columns of the array.

6. The system of claim 1 wherein the signal processing circuitry defines the individual beams by individually controlling each element of the array.

7. The system of claim 1 wherein the signal processing circuitry defines the individual beams simultaneously.

8. The system of claim 1 wherein individual beams are oriented in different directions.

9. The system of claim 2 further comprising fiber converters coupled between the digital converter circuit and the signal processing circuitry to optically pass the signals therebetween.

10. The system of claim 1 wherein the converter circuitry divides the communication frequency band into multiple band portions for conversion.

11. The system of claim 2 wherein the frequency converter circuit divides the communication frequency band into multiple bands for conversion and the digital converter circuit individually converts each of the multiple bands.

12. The system of claim 1 wherein the antenna array of elements is operable to define multiple, individual beams for signals in a plurality of communication frequency bands.

13. The system of claim 12 further comprising a frequency multiplexor coupled between the antenna and the converter circuitry to provide transmit and receive signals for each of the plurality of communication frequency bands for individual conversion.

14. The system of claim 1 wherein the signal processing circuitry is further operable to selectively drive the antenna to steer at least one of the defined beams.

15. The system of claim 14 wherein the beam is steered in at least one of azimuth and elevation.

16. A cellular RF link system for accommodating multiple service providers comprising:

a tower defining a plurality of sectors;

a plurality of sector antennas positioned proximate the top of the tower, each sector antenna oriented to face a sector and having an array of elements operable to define multiple, individual beams in that sector for signals in a communication frequency band;

converter circuitry to convert the antenna signals of the sector antennas between the communication frequency band and a digital band;

filtering circuitry defining individual portions of the digital band for a sector, a band portion defined for signals of each of at least two individual service providers in the sector;

signal processing circuitry for each of the at least two service providers, the signal processing circuitry operable to process signals associated with the individual band portions defined for the individual service providers in the sectors and to simultaneously drive the antenna to define at least one individual beam in each sector for each individual service provider in that sector.

17. The system of claim 16 wherein the signal processing circuitry is further operable to define multiple individual beams in each sector for each individual service provider in that sector.

18. The system of claim 16 wherein at least one sector antenna comprises an array of elements arranged in columns of multiple elements, the signal processing circuitry operable to define the individual beams in that sector by individually controlling each of the columns of the array.

19. The system of claim 16 wherein the signal processing circuitry is operable to define the individual beams in that sector by individually controlling each element of the array.

20. The system of claim 16 wherein said signal processing circuitry defines the individual beams simultaneously.

21. The system of claim 16 wherein individual beams are oriented in different directions.

22. The system of claim 16 wherein the antenna array of elements is operable to define multiple, individual beams in a sector for signals in a plurality of communication frequency bands.

23. The system of claim 16 wherein the signal processing circuitry is further operable to selectively drive the antenna to steer at least one of the defined beams in a sector.

24. The system of claim 23 wherein the beam is steered in at least one of azimuth and elevation.

25. A microwave backhaul system for accommodating multiple service providers comprising:

a tower defining a plurality of sectors;

a plurality of sector antennas positioned proximate the top of the tower, each sector antenna oriented to face a sector and having an array of elements operable to define multiple, individual beams in that sector for signals in microwave backhaul frequency band;

converter circuitry to convert the antenna signals of the sector antennas between the microwave backhaul frequency band and a digital band;

filtering circuitry defining individual portions of the digital band for a sector, a band portion defined for signals of each of at least two individual service providers in the sector;

signal processing circuitry for each of the at least two service providers, the signal processing circuitry operable to process signals associated with the individual band portions defined for the individual service providers in the sectors and to simultaneously drive the antenna to define at least one individual beam in each sector for each individual service provider in that sector.

26. The system of claim 25 wherein the signal processing circuitry is further operable to define multiple individual beams in each sector for each individual service provider in that sector.

27. The system of claim 25 wherein at least one sector antenna comprises an array of elements arranged in columns of multiple elements, the signal processing circuitry operable to define the individual beams in that sector by individually controlling each of the columns of the array.

28. The system of claim 25 wherein the signal processing circuitry is operable to define the individual beams in that sector by individually controlling each element of the array.

29. The system of claim 25 wherein said signal processing circuitry defines the individual beams simultaneously.

30. The system of claim 25 wherein individual beams are oriented in different directions.

31. The system of claim 25 wherein the antenna array of elements is operable to define multiple, individual beams in a sector for signals in a plurality of microwave backhaul frequency bands.

32. The system of claim 25 wherein the signal processing circuitry is further operable to selectively drive the antenna to steer at least one of the defined beams in a sector.

33. The system of claim 32 wherein the beam is steered in at least one of azimuth and elevation.

0502666.0004

34. A method for sharing a cellular tower among multiple service providers comprising:

generating at least one individual beam for a first service provider in a first band portion and for use through an antenna having an array of elements operable to define multiple, individual beams for signals in at least one communication frequency band;

generating at least one other individual beam for a second service provider in a second band portion and for use through said antenna.

09026505.090430

35. The method of claim 34 further comprising generating multiple individual beams for each individual service provider.

36. The method of claim 34 wherein the antenna comprises an array of elements arranged in columns of multiple elements, the method further comprising individually controlling each of the columns of the array to generate the individual beams.

37. The method of claim 34 further comprising individually controlling each element of the array to generate the individual beams.

38. The method of claim 34 further comprising generating the individual beams simultaneously.

39. The method of claim 34 wherein the antenna is operable to define beams in multiple communication frequency bands and the method further comprises:

generating, for each of the communication frequency bands, an individual beam for each service provider in a corresponding band portion of the communication frequency band.

40. The method of claim 34 further comprising steering at least one of the individual beams.

41. The method of claim 40 further comprising steering in at least one of azimuth and elevation.

42. The method of claim 34 further comprising defining the communication frequency band as multiple band portions by converting antenna signals associated with the beams between the communication frequency band and a digital band, and dividing the digital band into multiple band portions.

43. The method of claim 34 wherein said communication frequency band includes one of an RF link frequency band and a microwave backhaul frequency band.

44. A method for sharing a cellular tower among multiple RF link service providers comprising:

generating at least one individual beam for a first service provider in a first band portion and for use through an antenna having an array of elements operable to define multiple, individual beams for signals in at least one RF link frequency band;

generating at least one other individual beam for a second service provider in a second band portion and for use through said antenna.

45. The method of claim 44 further comprising generating multiple individual RF link beams for each individual service provider.

46. The method of claim 44 further comprising generating the individual RF link beams simultaneously.

47. The method of claim 44 further comprising steering at least one of the individual RF link beams.

48. The method of claim 45 further comprising steering in at least one of azimuth and elevation.

Patent Application

49. A method for sharing a cellular tower among multiple service providers requiring microwave backhaul applications comprising:

generating at least on individual beam for a first service provider in a first band portion and for use through an antenna having an array of elements operable to define multiple, individual beams for signals in at least one microwave backhaul frequency band;

generating at least one other individual beam for a second service provider in a second band portion and for use through said antenna.

50. The method of claim 49 further comprising generating multiple individual microwave backhaul beams for each individual service provider.

51. The method of claim 49 further comprising generating the individual microwave backhaul beams simultaneously.

52. The method of claim 49 further comprising steering at least one of the individual microwave backhaul beams.

53. The method of claim 52 further comprising steering in at least one of azimuth and elevation.

54. A method for sharing a cellular tower among multiple service providers comprising:

converting a communication frequency band to a digital band;

assigning portions of the digital band to multiple service providers, each digital band portion being associated with a portion of the communication frequency band corresponding to a service provider;

utilizing the digital band portion assigned to a service provider to generate at least one individual beam for the service provider through an antenna having an array of elements operable to define multiple, individual beams.

55. A cellular tower shared among multiple service providers comprising:

an antenna positioned proximate the top of the tower and having an array of elements operable to define multiple, individual beams for signals in a communication frequency band;

converter circuitry to define a digital band from the communication frequency band;

signal processing circuitry for each of the at least two service providers, the signal processing circuitry operable to process individual digital band portions corresponding to the service providers and to simultaneously drive the antenna to define at least one individual beam for each individual service provider.